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Imai

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(54) **IMAGE PROCESSING APPARATUS, IMAGE PROCESSING METHOD, AND STORAGE MEDIUM**

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G06F 3/12	(2006.01)
G06K 15/00	(2006.01)
H04N 1/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/12*** (2013.01); ***G06K 15/002*** (2013.01); *G06K 15/40* (2013.01); ***H04N 1/00*** (2013.01); ***G06K 15/407*** (2013.01)

(58) **Field of Classification Search**

CPC G06Q 30/02; G06Q 30/0269; G06Q 30/0277; G06Q 30/0201; G06Q 30/0204; G06F 3/12; G06K 15/002; G06K 15/40; G06K 15/407; H04N 1/00; H04N 1/40068; H04N 1/58; H04N 1/642

USPC 358/1.9, 1.14, 1.15, 527; 399/79, 9, 10, 399/11, 24, 25, 26

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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JP 2002-091743 A 3/2002

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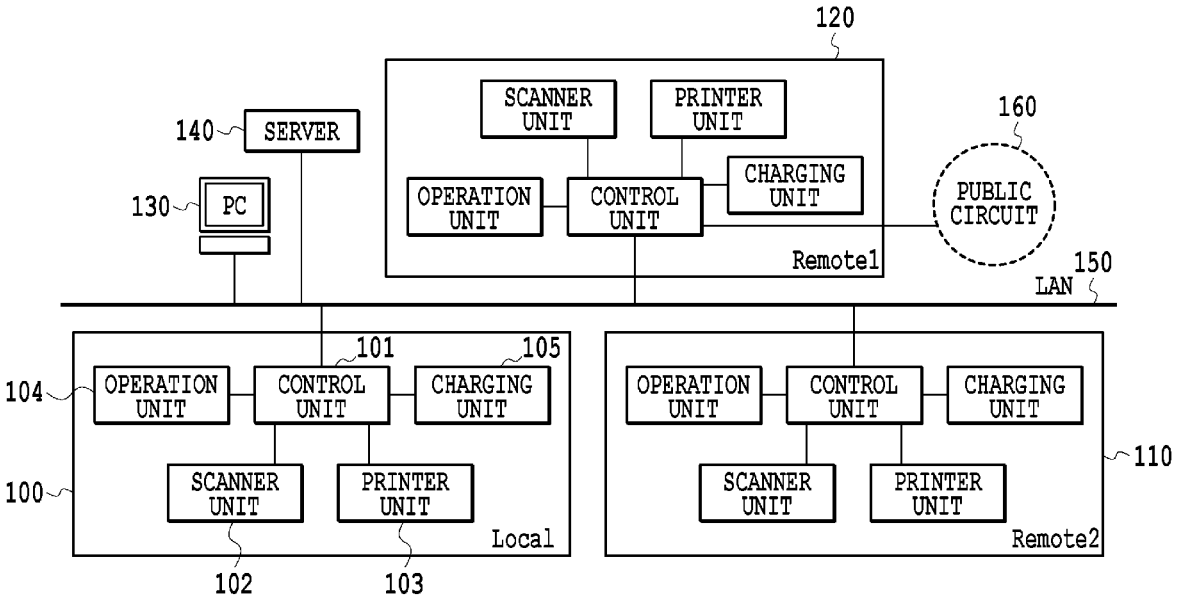
(57) **ABSTRACT**

In the case where charging by grade in accordance with a plurality of image attributes is performed, it is not possible for a user to identify the image attribute with which printing is performed from the appearance of printed matter that is output. In accordance with a color pixel ratio in image data, an image attribute of the image data is determined and a display unit is controlled to display the determined image attribute and the color pixel ratio.

13 Claims, 18 Drawing Sheets



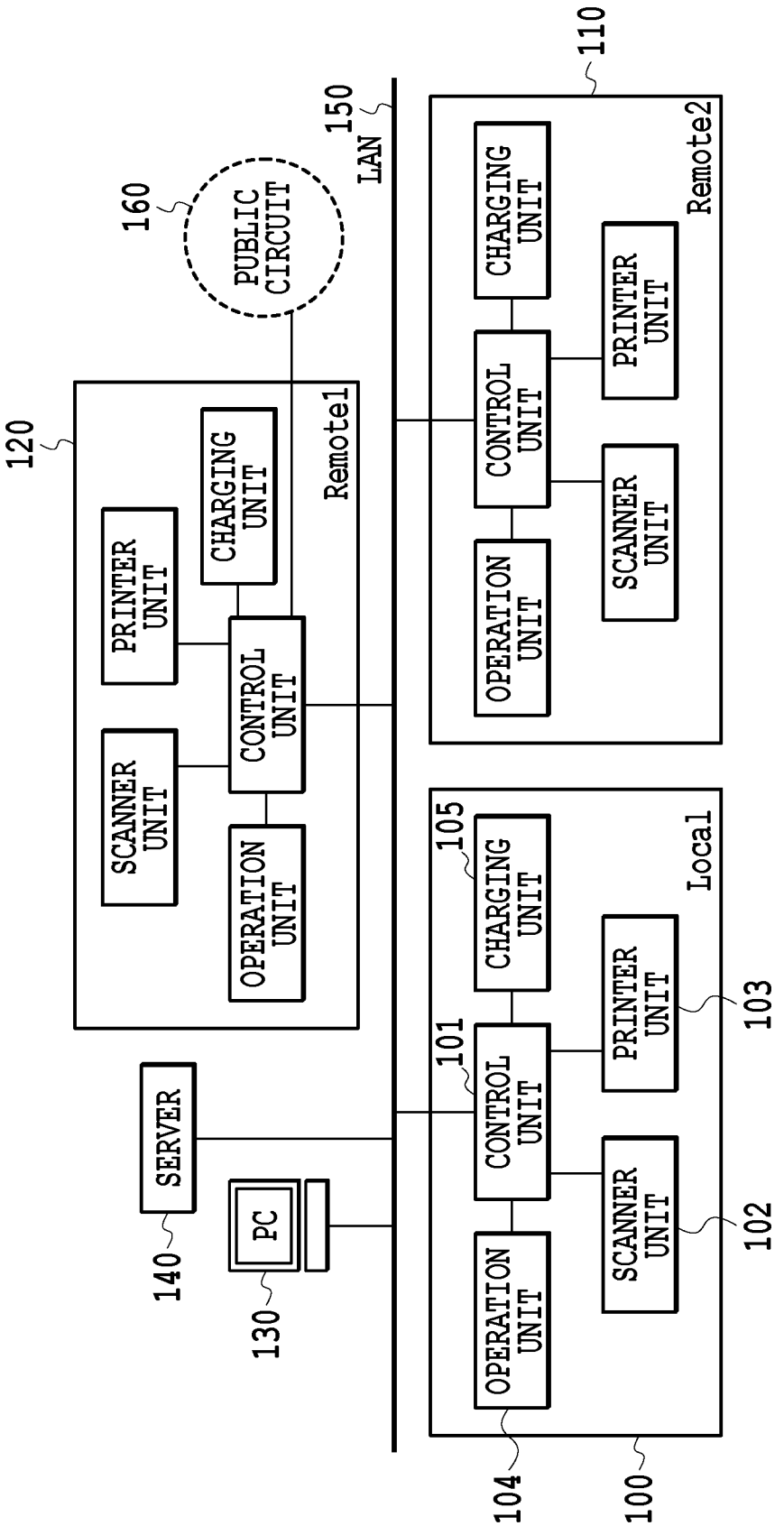

120
Remote1
PRINTER UNIT
CHARGING UNIT
SCANNER UNIT
CONTROL UNIT
OPERATION UNIT
160
PUBLIC CIRCUIT
150
LAN
110
Remote2
CHARGING UNIT
PRINTER UNIT
CONTROL UNIT
SCANNER UNIT
OPERATION UNIT
105
Local1
CHARGING UNIT
101
CONTROL UNIT
PRINTER UNIT
103
SCANNER UNIT
102
OPERATION UNIT
104
100
SERVER
140
PC
130

FIG.1

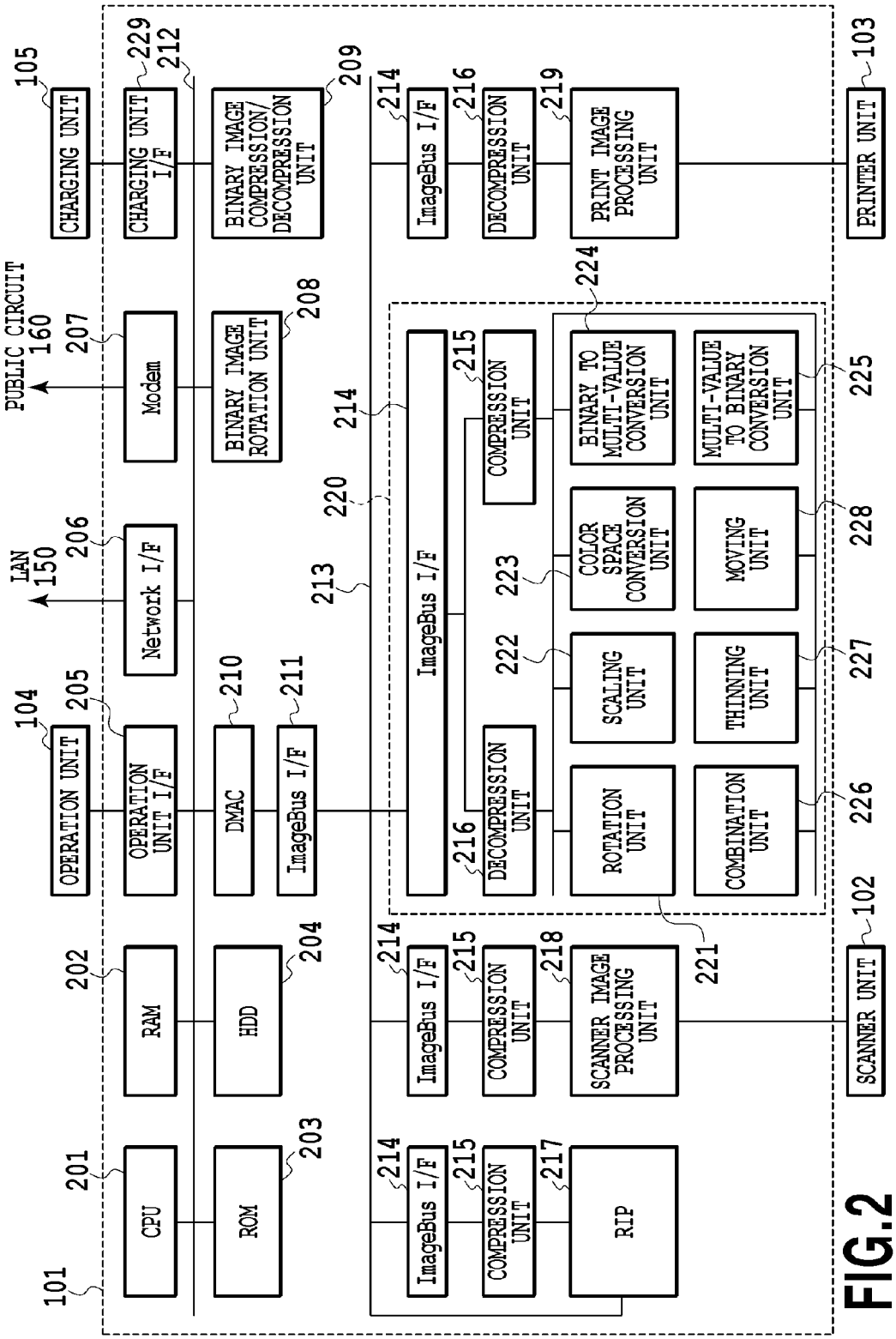

101
CPU
201
ROM
203
RAM
202
HDD
204
OPERATION UNIT
104
OPERATION UNIT I/F
205
DMAC
210
ImageBus I/F
211
Network I/F
206
LAN
150
Modem
207
PUBLIC CIRCUIT
160
BINARY IMAGE ROTATION UNIT
208
BINARY IMAGE COMPRESSION/ DECOMPRESSION UNIT
209
CHARGING UNIT I/F
212
CHARGING UNIT
105
213
214
ImageBus I/F
215
COMPRESSION UNIT
217
RIP
ImageBus I/F
215
COMPRESSION UNIT
218
SCANNER IMAGE PROCESSING UNIT
221
SCANNER UNIT
102
220
ImageBus I/F
216
DECOMPRESSION UNIT
222
SCALING UNIT
223
COLOR SPACE CONVERSION UNIT
224
BINARY TO MULTI-VALUE CONVERSION UNIT
COMPRESSION UNIT
215
ROTATION UNIT
THINNING UNIT
227
MOVING UNIT
228
MULTI-VALUE TO BINARY CONVERSION UNIT
225
COMBINATION UNIT
226
ImageBus I/F
214
DECOMPRESSION UNIT
216
PRINT IMAGE PROCESSING UNIT
219
DECOMPRESSION UNIT
216
ImageBus I/F
214
PRINTER UNIT
103

FIG.2

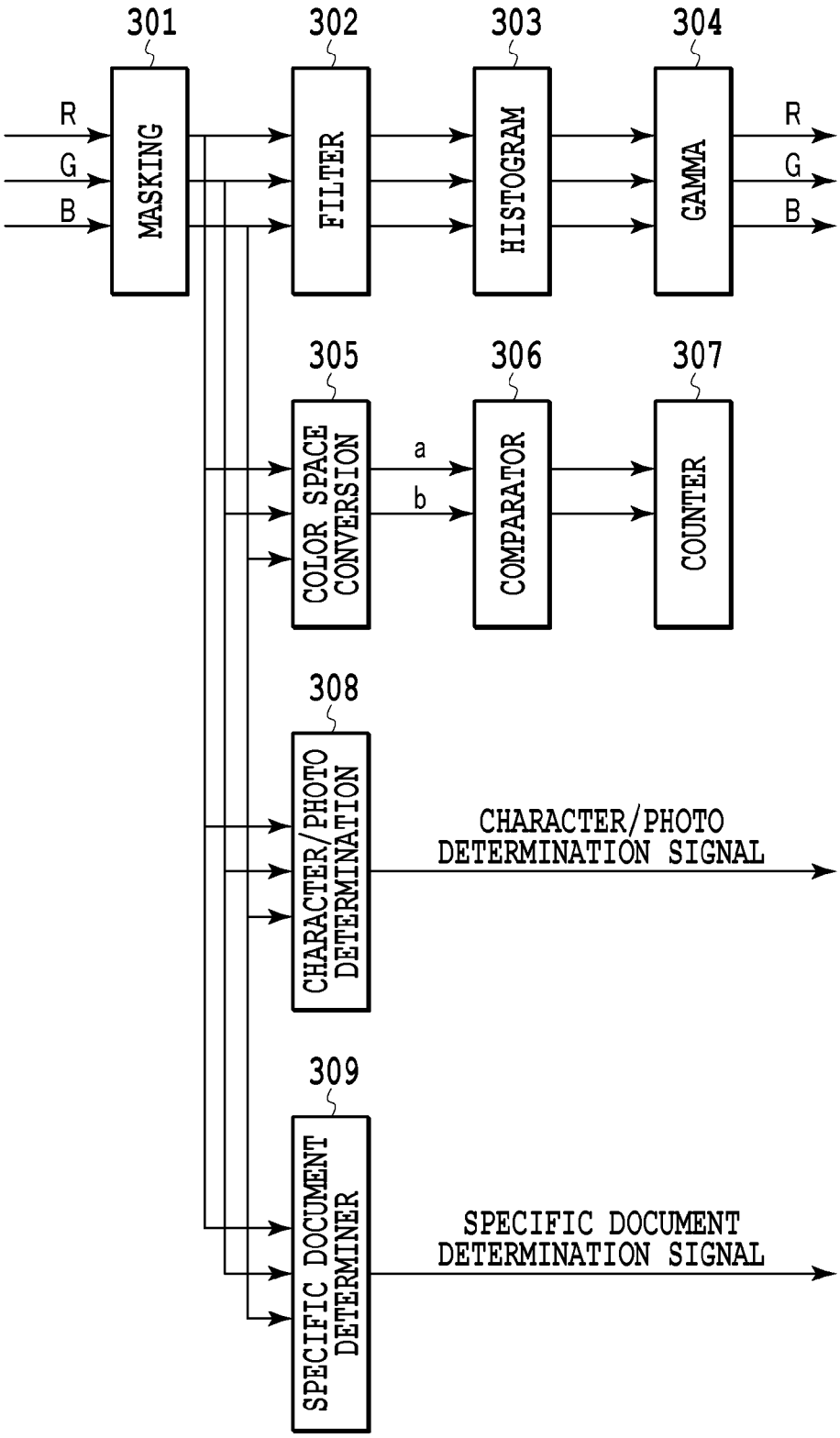

301
302
303
304
R
G
B
MASKING
FILTER
HISTOGRAM
GAMMA
R
G
B
305
306
307
COLOR SPACE CONVERSION
a
b
COMPARATOR
COUNTER
308
CHARACTER/PHOTO DETERMINATION
CHARACTER/PHOTO DETERMINATION SIGNAL
309
SPECIFIC DOCUMENT DETERMINER
SPECIFIC DOCUMENT DETERMINATION SIGNAL

FIG.3

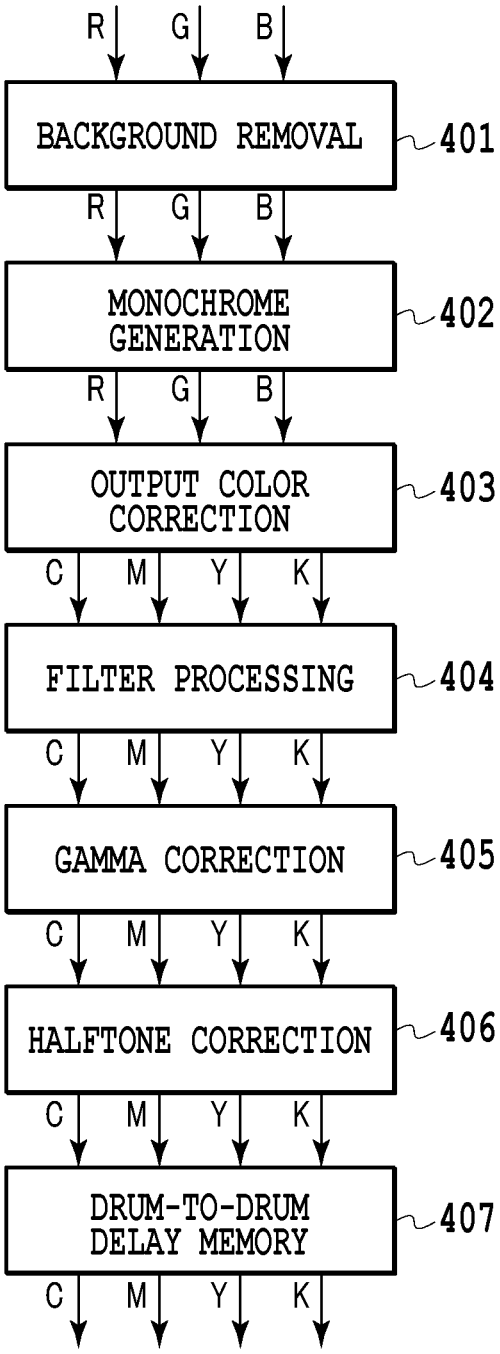

R
G
B
BACKGROUND REMOVAL
401
R
G
B
MONOCHROME GENERATION
402
R
G
B
OUTPUT COLOR CORRECTION
403
C
M
Y
K
FILTER PROCESSING
404
C
M
Y
K
GAMMA CORRECTION
405
C
M
Y
K
HALFTONE CORRECTION
406
C
M
Y
K
DRUM-TO-DRUM DELAY MEMORY
407
C
M
Y
K

FIG.4

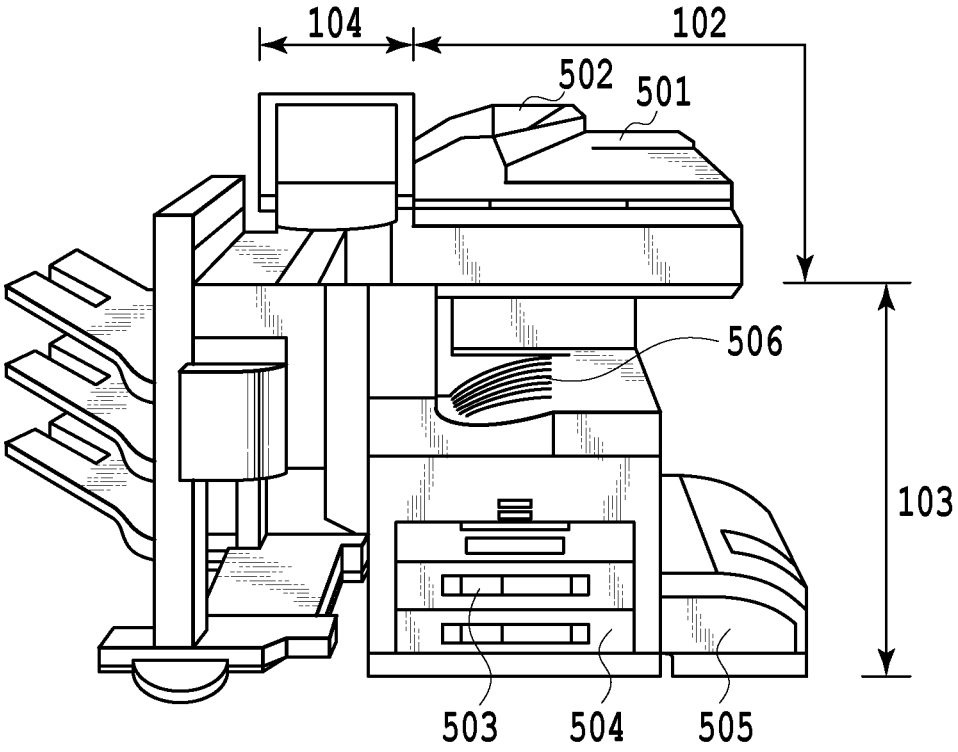


FIG.5

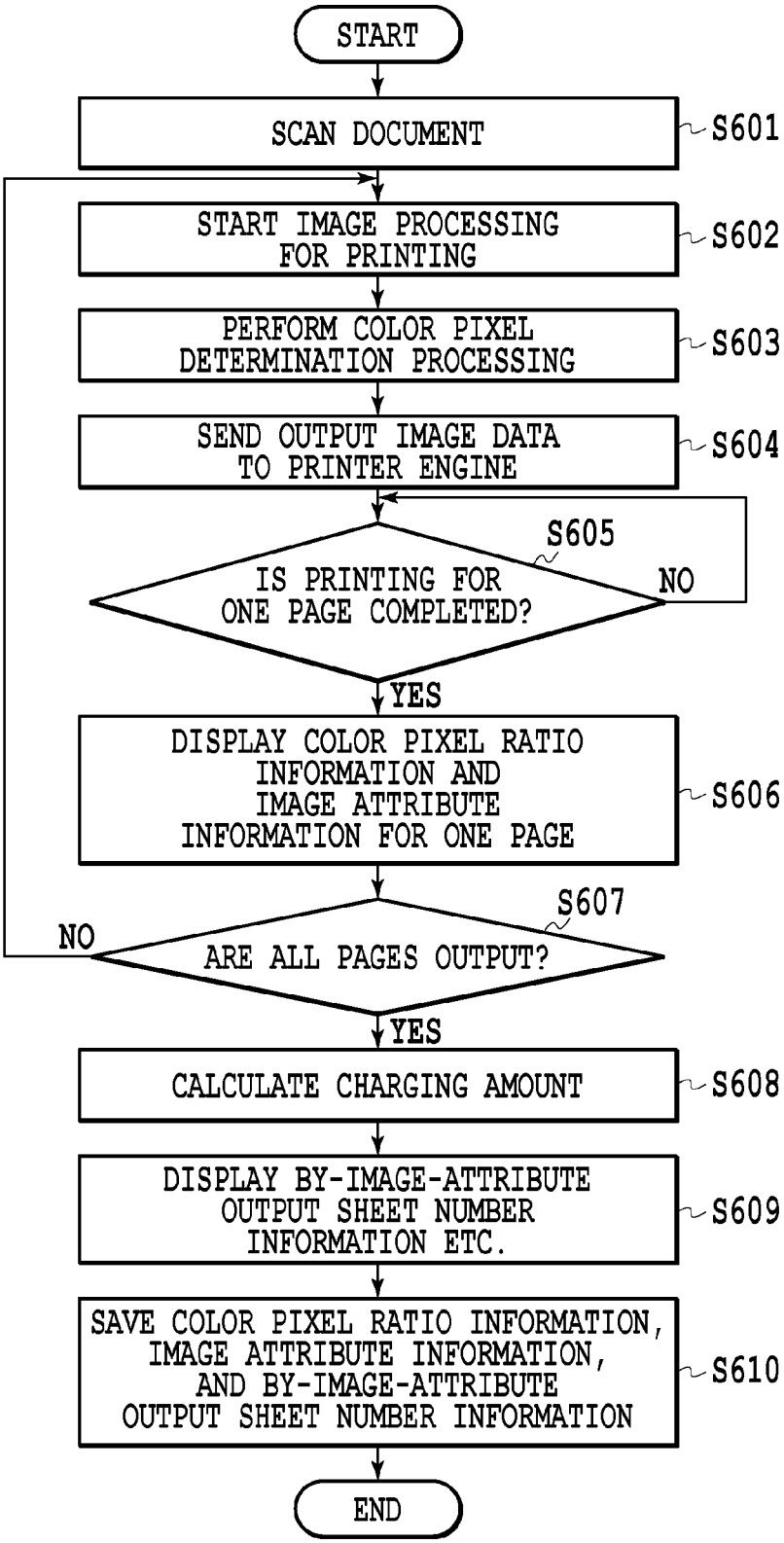

START
SCAN DOCUMENT
S601
START IMAGE PROCESSING FOR PRINTING
S602
PERFORM COLOR PIXEL DETERMINATION PROCESSING
S603
SEND OUTPUT IMAGE DATA TO PRINTER ENGINE
S604
S605
IS PRINTING FOR ONE PAGE COMPLETED?
NO
YES
DISPLAY COLOR PIXEL RATIO INFORMATION AND IMAGE ATTRIBUTE INFORMATION FOR ONE PAGE
S606
S607
NO
ARE ALL PAGES OUTPUT?
YES
CALCULATE CHARGING AMOUNT
S608
DISPLAY BY-IMAGE-ATTRIBUTE OUTPUT SHEET NUMBER INFORMATION ETC.
S609
SAVE COLOR PIXEL RATIO INFORMATION, IMAGE ATTRIBUTE INFORMATION, AND BY-IMAGE-ATTRIBUTE OUTPUT SHEET NUMBER INFORMATION
S610
END

FIG.6

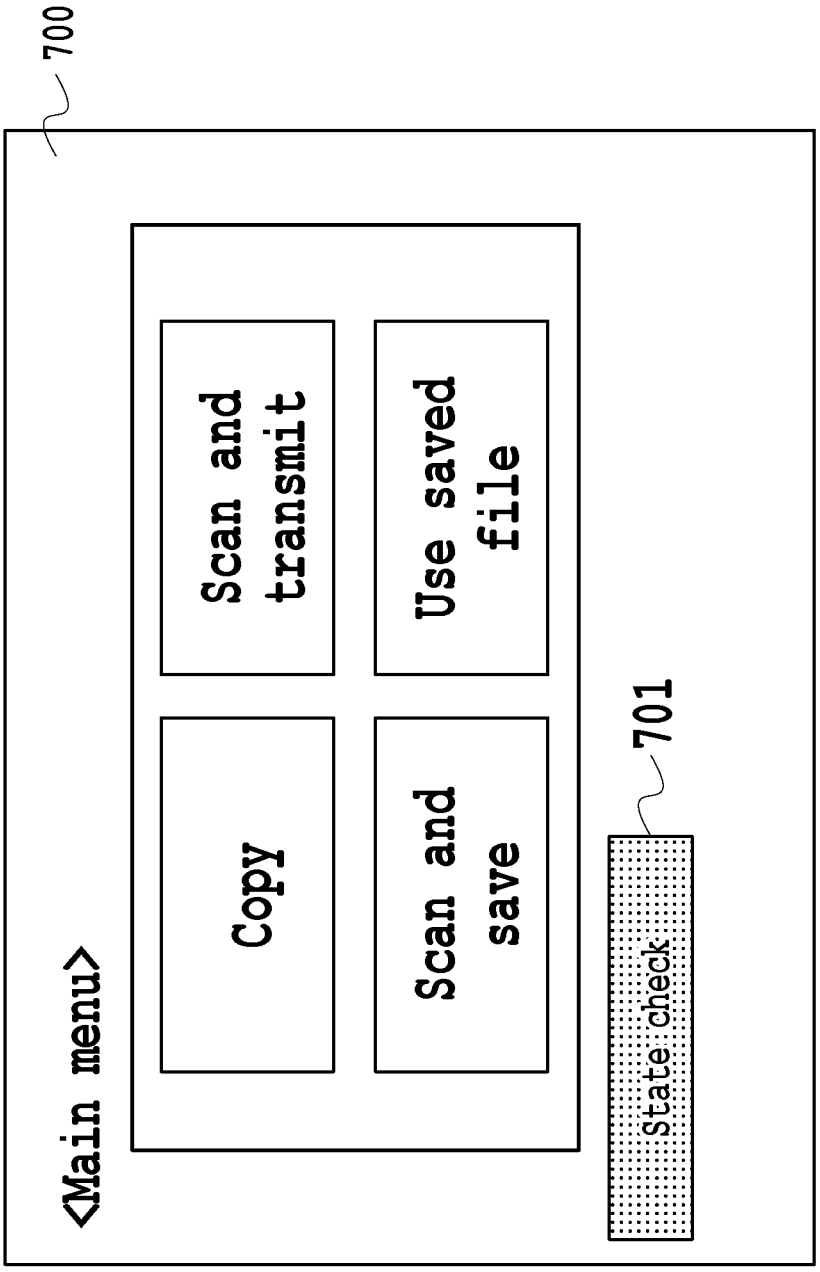

700
<Main menu>
Copy
Scan and save
Scan and transmit
Use saved file
701
State check

FIG.7

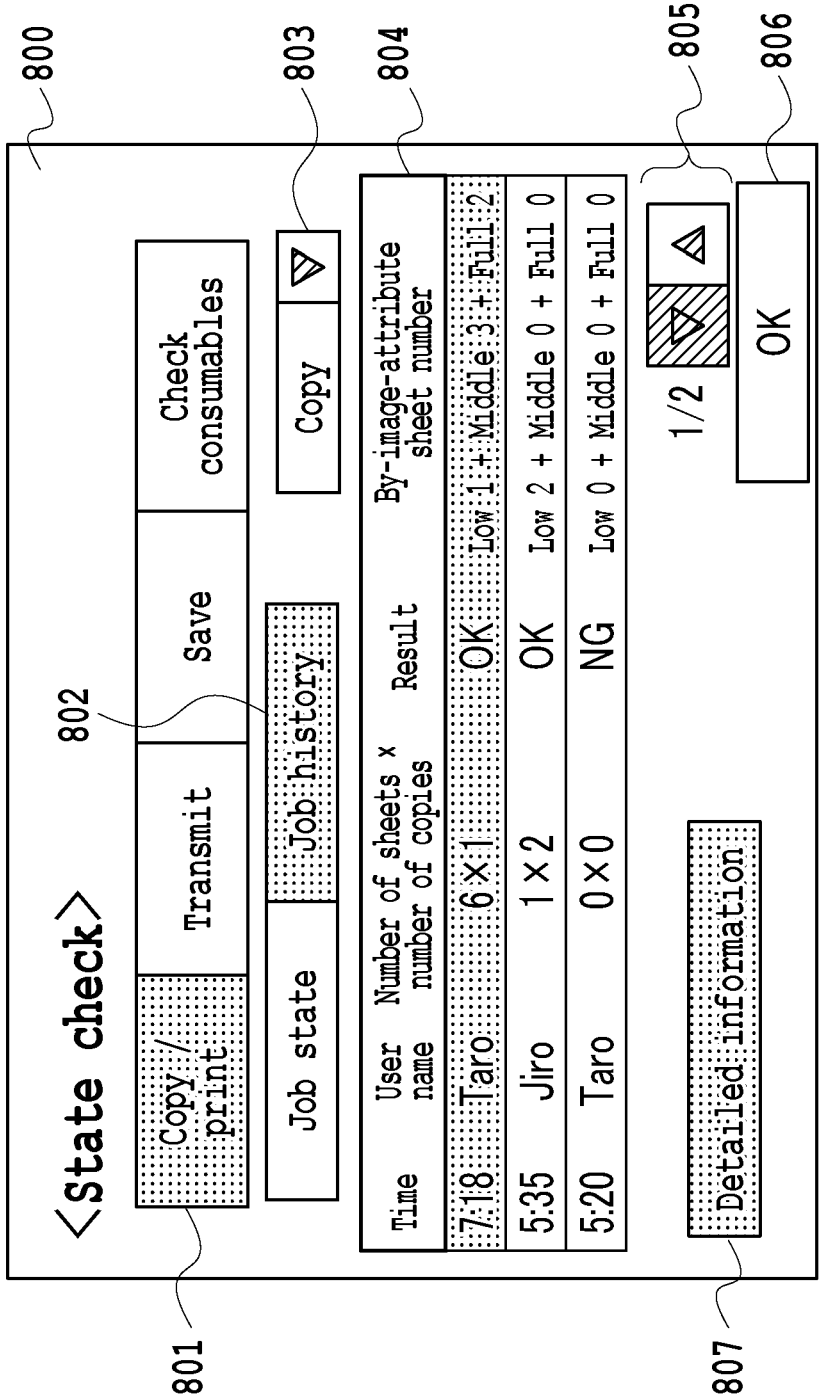

800
803
804
805
806
802
<State check>
Copy / print
Transmit
Save
Check consumables
Job state
Job history
Copy
Time
User name
Number of sheets x number of copies
Result
By-image-attribute sheet number
7:18 Taro 6×1 OK Low 1 + Middle 3 + Full 2
5:35 Jiro 1×2 OK Low 2 + Middle 0 + Full 0
5:20 Taro 0×0 NG Low 0 + Middle 0 + Full 0
1/2
OK
Detailed information
801
807

FIG.8

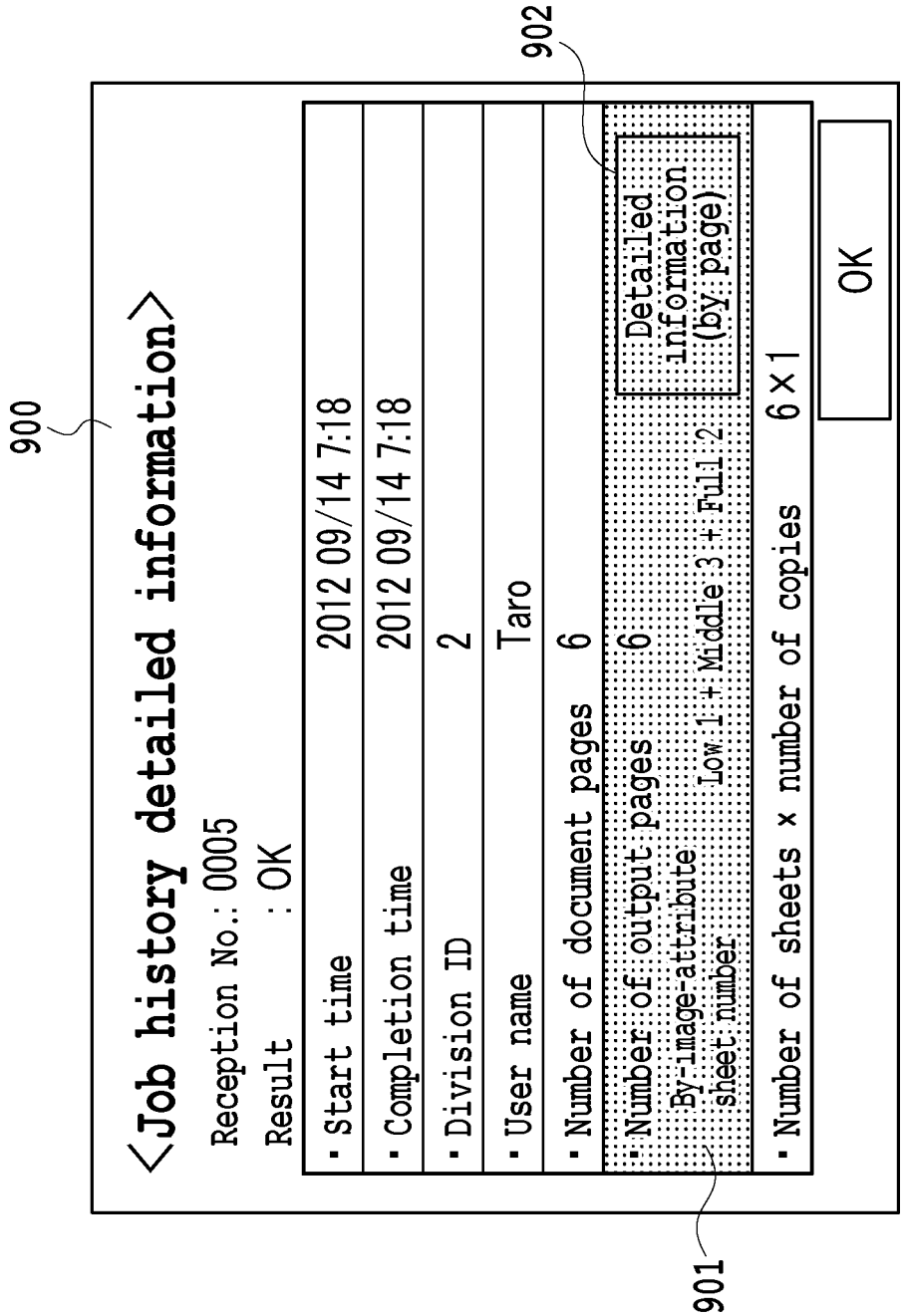

900
<Job history detailed information>
Reception No.: 0005
Result : OK
· Start time 2012 09/14 7:18
· Completion time 2012 09/14 7:18
· Division ID 2
· User name Taro
· Number of document pages 6
· Number of output pages 6
By-image-attribute Low 1 + Middle 3 + Full 2 sheet number
· Number of sheets × number of copies 6 × 1
Detailed information (by page)
OK
901
902

FIG.9

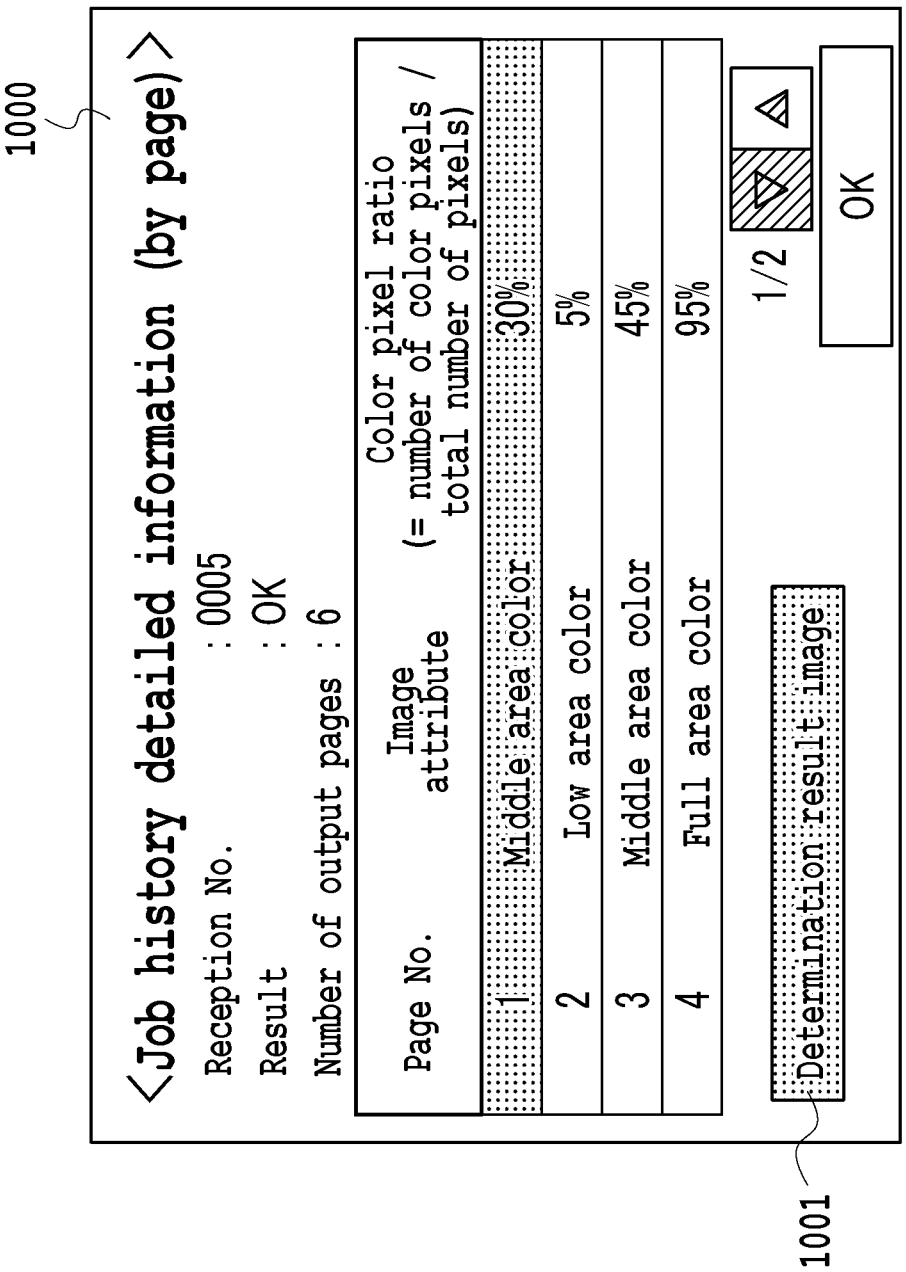

1000
<Job history detailed information (by page)>
Reception No. : 0005
Result : OK
Number of output pages : 6
Page No.
Image attribute
Color pixel ratio (= number of color pixels / total number of pixels)
1 Middle area color 30%
2 Low area color 5%
3 Middle area color 45%
4 Full area color 95%
1/2
OK
Determination result image
1001

FIG.10

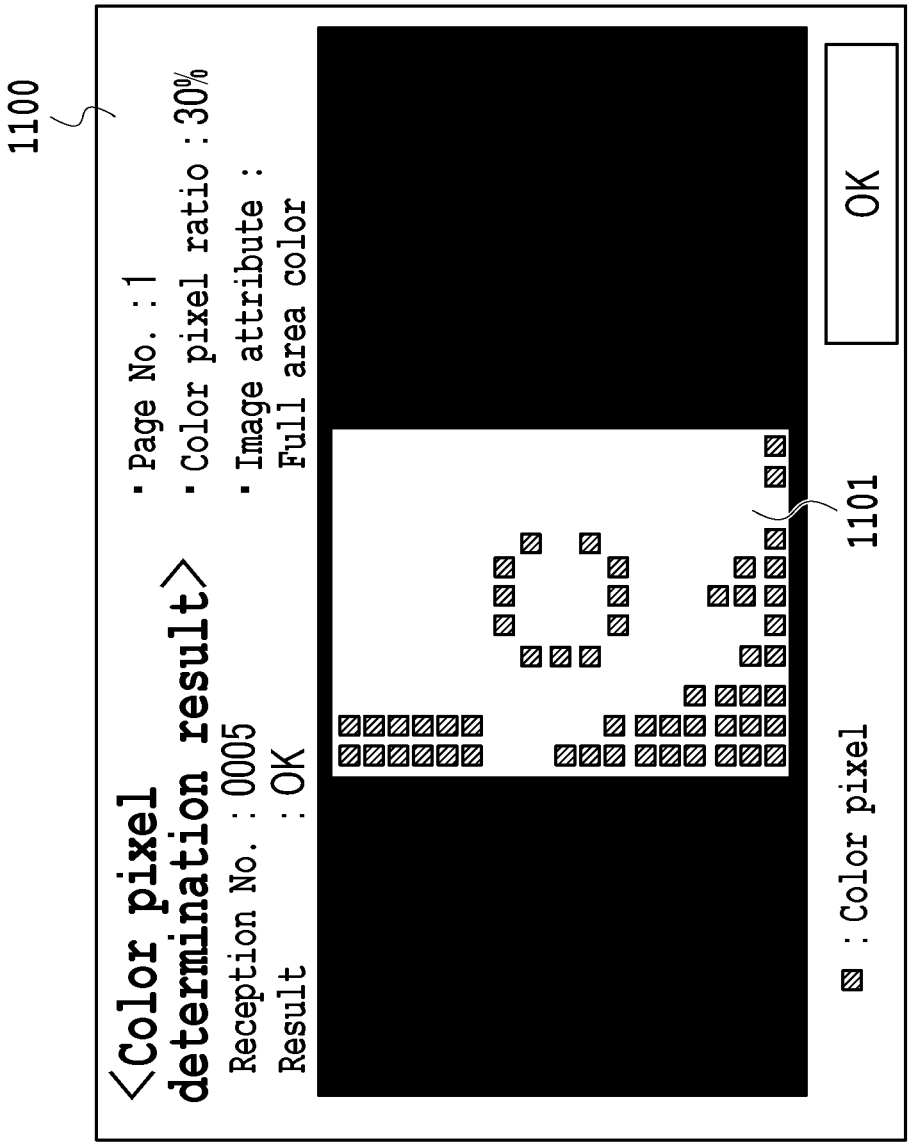

1100
<Color pixel determination result>
Reception No. : 0005
Result : OK
▪ Page No. : 1
▪ Color pixel ratio : 30%
▪ Image attribute :
Full area color
OK
1101
: Color pixel

FIG.11

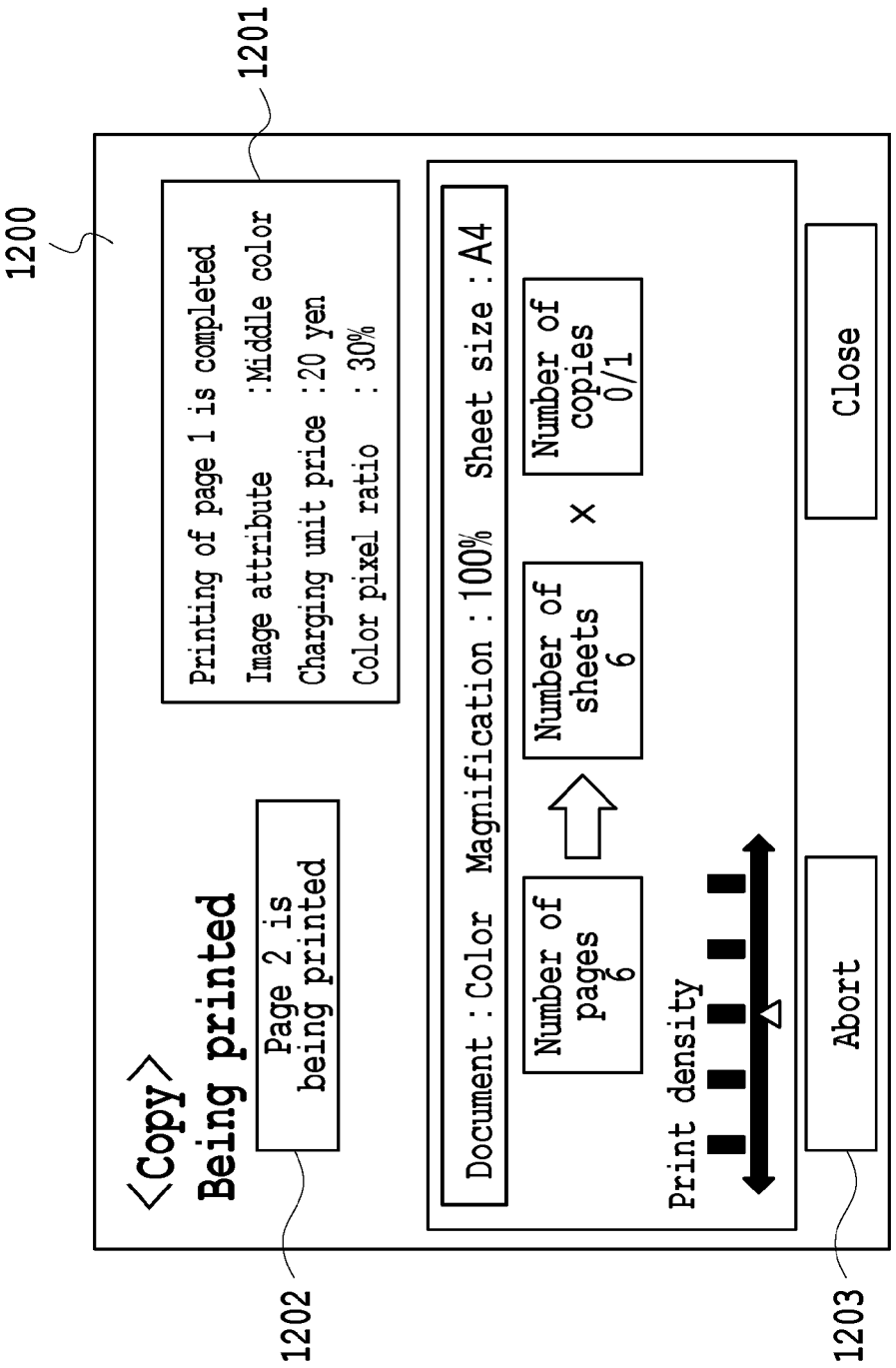

1200
1201
1202
1203
<Copy>
Being printed
Page 2 is being printed
Printing of page 1 is completed
Image attribute :Middle color
Charging unit price :20 yen
Color pixel ratio : 30%
Document : Color Magnification : 100% Sheet size : A4
Number of pages 6
Number of sheets 6
×
Number of copies 0/1
Print density
Abort
Close

FIG.12

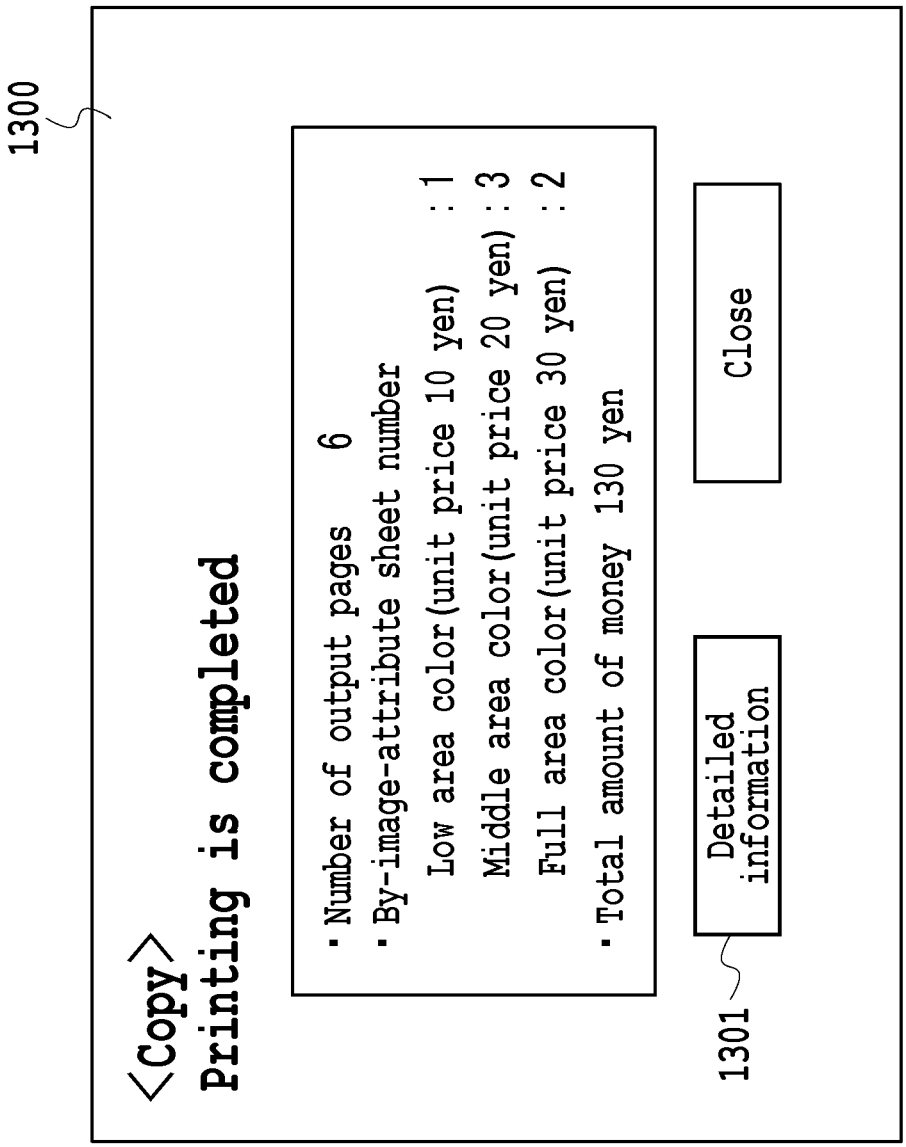

1300
<Copy>
Printing is completed
· Number of output pages 6
· By-image-attribute sheet number
Low area color(unit price 10 yen) : 1
Middle area color(unit price 20 yen) : 3
Full area color(unit price 30 yen) : 2
· Total amount of money 130 yen
Detailed information
Close
1301

FIG.13

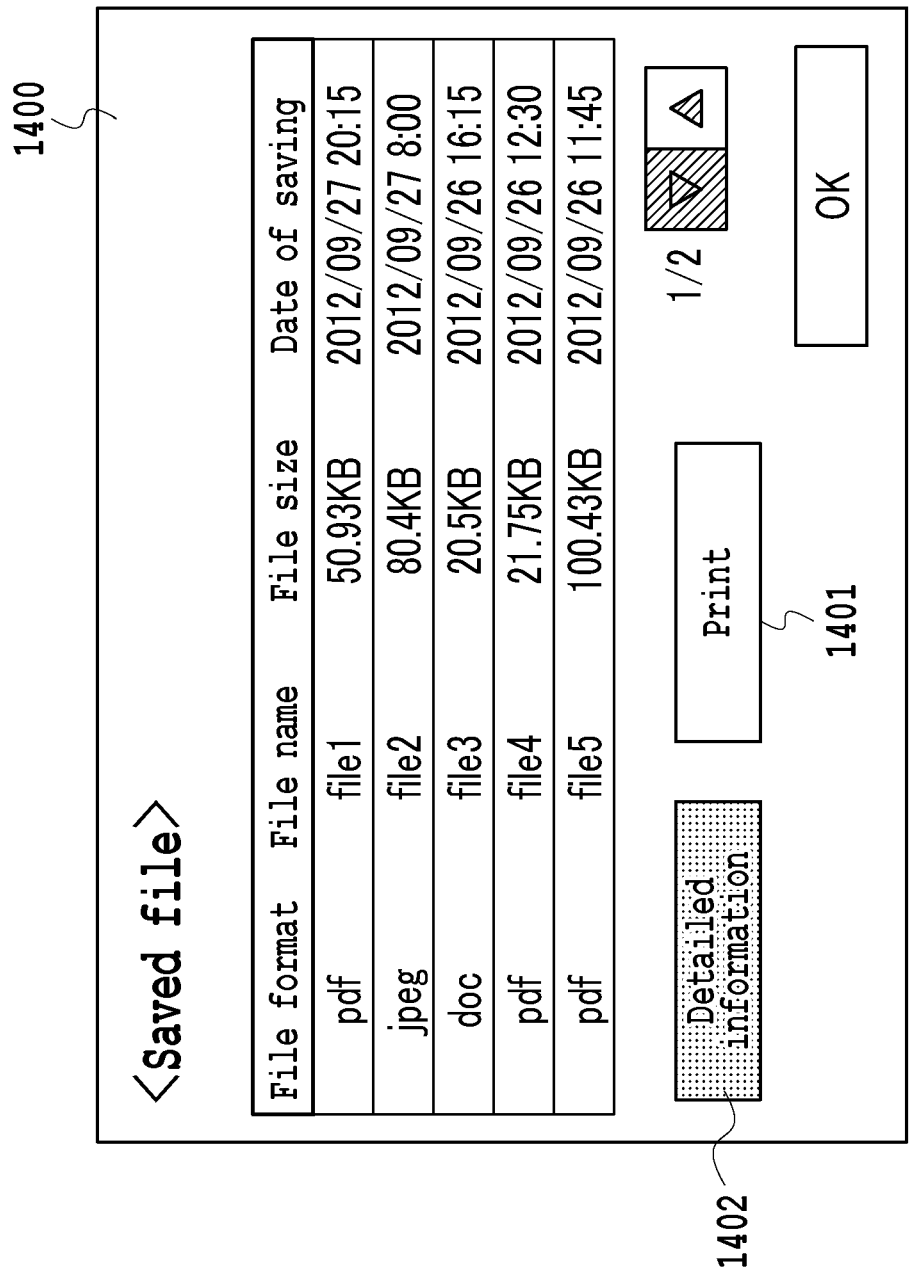

1400
<Saved file>
File format
File name
File size
Date of saving
pdf
file1
50.93KB
2012/09/27 20:15
jpeg
file2
80.4KB
2012/09/27 8:00
doc
file3
20.5KB
2012/09/26 16:15
pdf
file4
21.75KB
2012/09/26 12:30
pdf
file5
100.43KB
2012/09/26 11:45
1/2
Detailed information
Print
OK
1401
1402

FIG.14

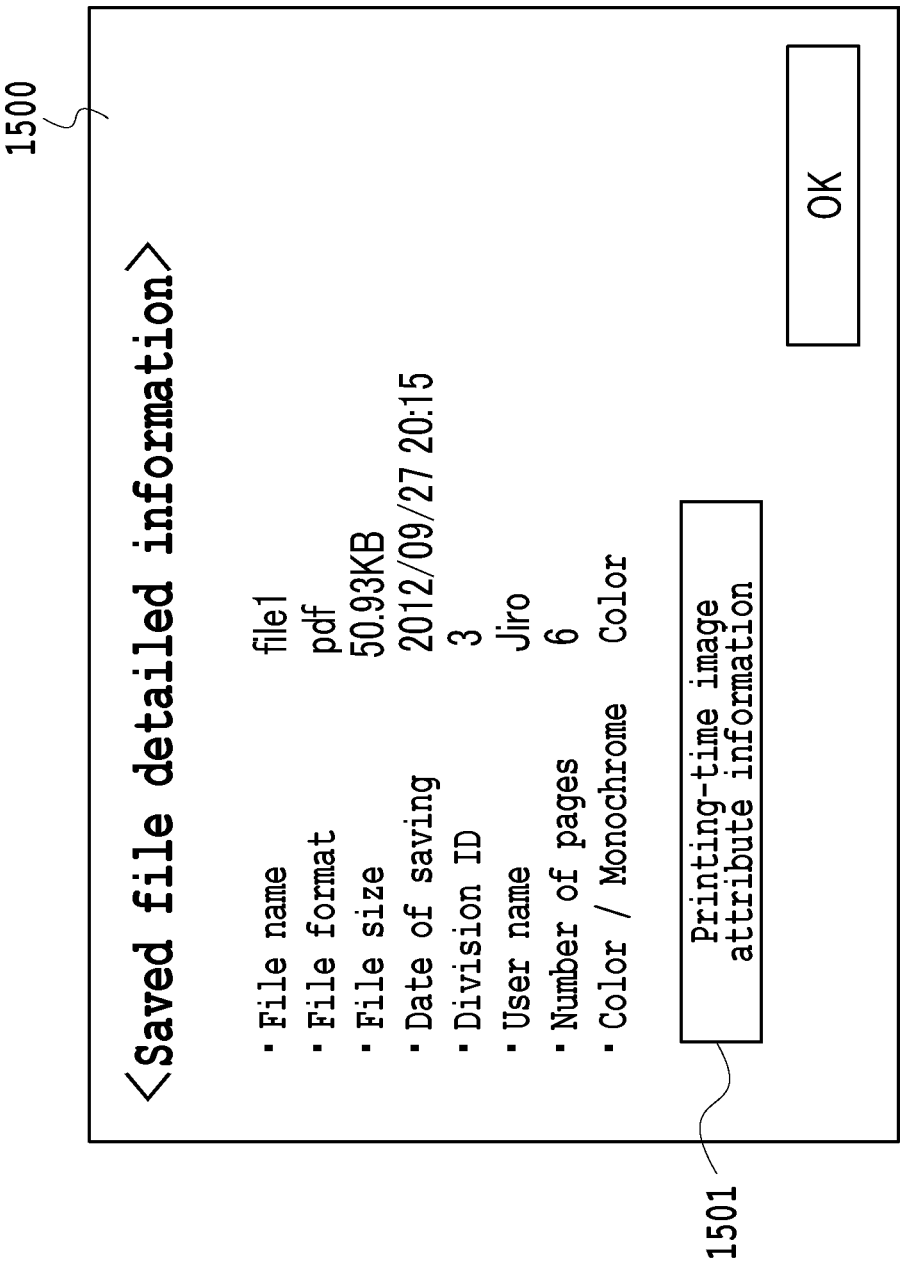

1500
<Saved file detailed information>
· File name file1
· File format pdf
· File size 50.93KB
· Date of saving 2012/09/27 20:15
· Division ID 3
· User name Jiro
· Number of pages 6
· Color / Monochrome Color
Printing-time image attribute information
OK
1501

FIG.15

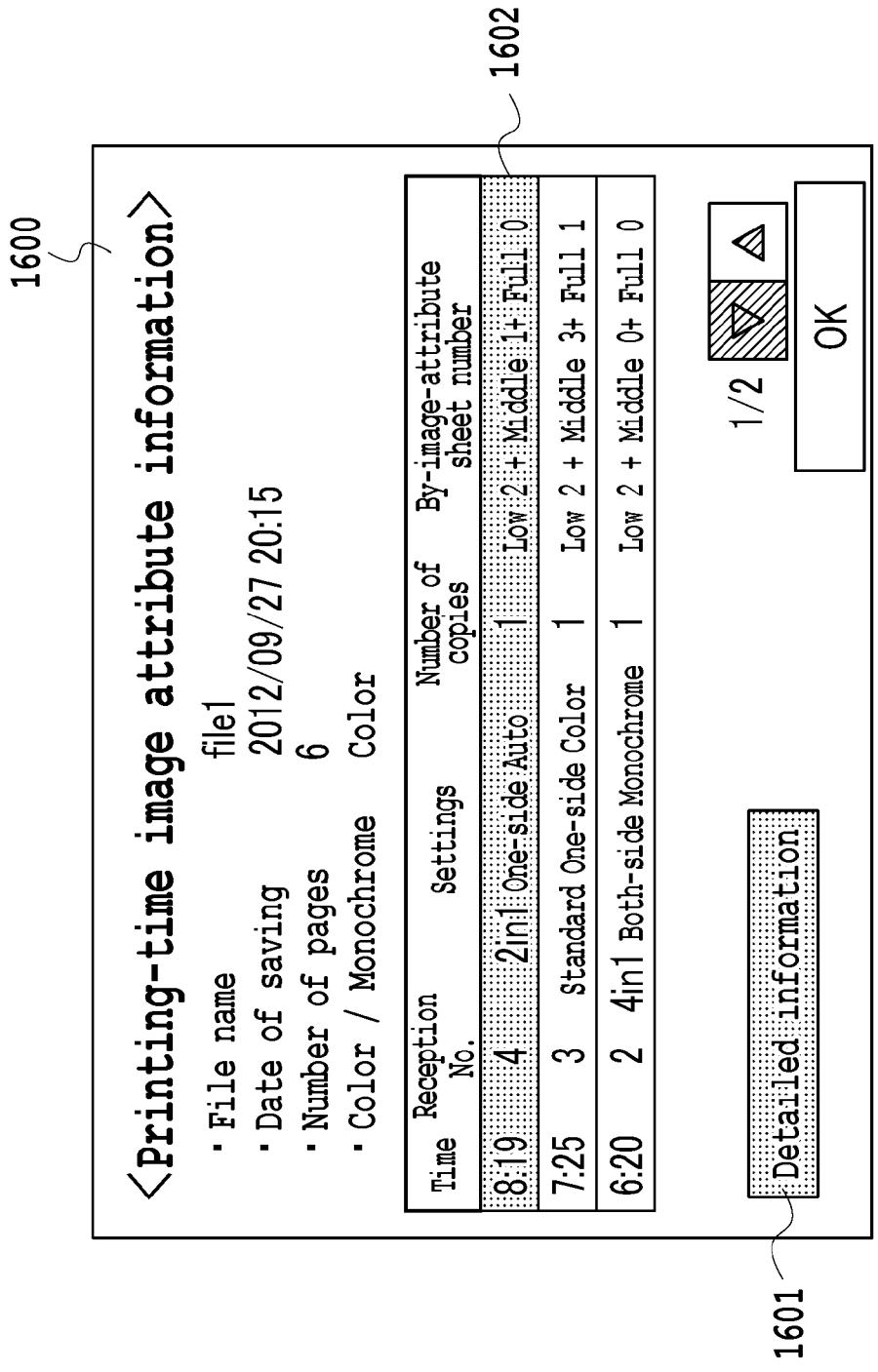

1600
<Printing-time image attribute information>
· File name file1
· Date of saving 2012/09/27 20:15
· Number of pages 6
· Color / Monochrome Color
1602
Time
Reception No.
Settings
Number of copies
By-image-attribute sheet number
8:19 4 2in1 One-side Auto 1 Low 2 + Middle 1+ Full 0
7:25 3 Standard One-side Color 1 Low 2 + Middle 3+ Full 1
6:20 2 4in1 Both-side Monochrome 1 Low 2 + Middle 0+ Full 0
1/2
OK
Detailed information
1601

FIG.16

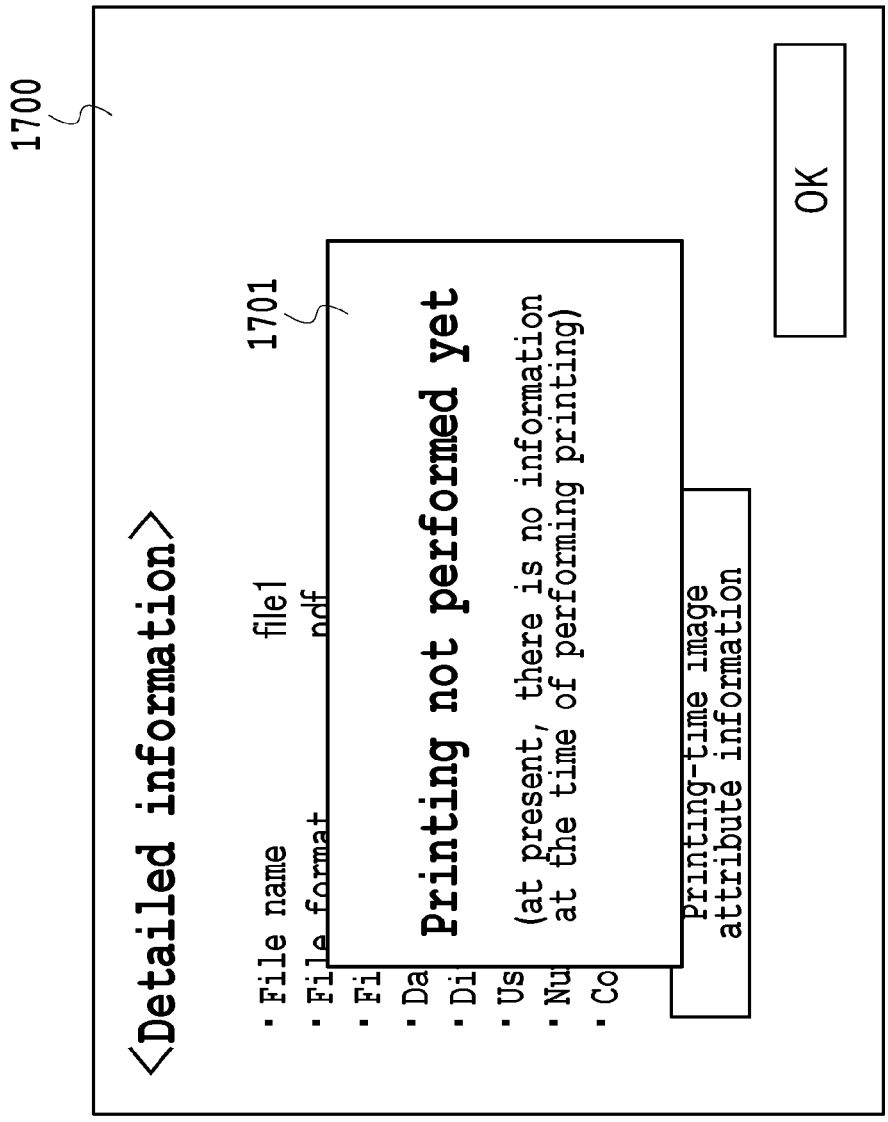

1700
<Detailed information>
· File name file1
· File format pdf
· Fi
· Da
· Di
· Us
· Nu
· Co
1701
Printing not performed yet
(at present, there is no information at the time of performing printing)
Printing-time image attribute information
OK

FIG.17

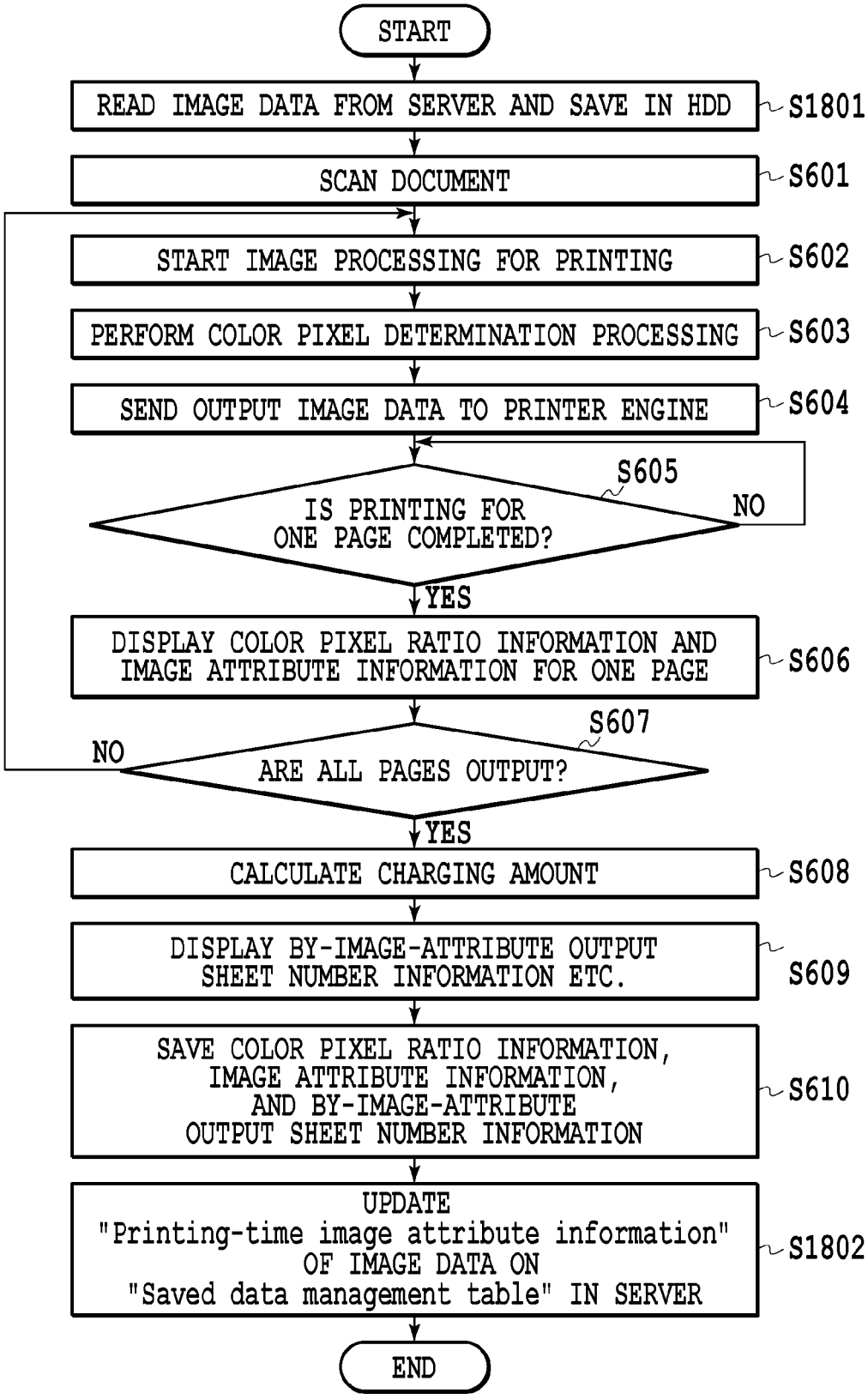

START
READ IMAGE DATA FROM SERVER AND SAVE IN HDD
S1801
SCAN DOCUMENT
S601
START IMAGE PROCESSING FOR PRINTING
S602
PERFORM COLOR PIXEL DETERMINATION PROCESSING
S603
SEND OUTPUT IMAGE DATA TO PRINTER ENGINE
S604
S605
IS PRINTING FOR ONE PAGE COMPLETED?
NO
YES
DISPLAY COLOR PIXEL RATIO INFORMATION AND IMAGE ATTRIBUTE INFORMATION FOR ONE PAGE
S606
S607
NO
ARE ALL PAGES OUTPUT?
YES
CALCULATE CHARGING AMOUNT
S608
DISPLAY BY-IMAGE-ATTRIBUTE OUTPUT SHEET NUMBER INFORMATION ETC.
S609
SAVE COLOR PIXEL RATIO INFORMATION, IMAGE ATTRIBUTE INFORMATION, AND BY-IMAGE-ATTRIBUTE OUTPUT SHEET NUMBER INFORMATION
S610
UPDATE "Printing-time image attribute information" OF IMAGE DATA ON "Saved data management table" IN SERVER
S1802
END

FIG.18

IMAGE PROCESSING APPARATUS, IMAGE PROCESSING METHOD, AND STORAGE MEDIUM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image processing apparatus, an image processing method, and a storage medium.

2. Description of the Related Art

Conventionally, most apparatuses have the charging method for printing that includes only two kinds of charging, i.e. charging at the time of printing in two or more colors (color printing) and charging at the time of monochrome printing (image attributes in two degrees of color and monochrome).

There is a case where some documents to be printed mostly in monochrome and only a portion to be printed in color which includes, for example, stamps, logotypes, etc. In the case such as this, despite that most of the document is printed in monochrome, the fee for color printing is charged as in the case where most of the document is printed in color. The reason is that in the case where data to be printed in monochrome and data to be printed in color exist mixedly in one output sheet, the color printing operation is performed (that is, printing is performed four times for CMYK).

Consequently, there has been such a problem that the printing cost of a user is raised because even for a document in which the majority of the page to be printed is a monochrome area, the fee for color printing is charged in the case where a color area exists even slightly.

For this problem, the system that charges for printing in accordance with a ratio of color print area included in one output sheet is proposed (see Japanese Patent Laid-Open No. 2002-091743). In this system, drawing information of PDL data input via a network is analyzed to calculate a ratio of color area and charging is performed in accordance with the calculated ratio.

By the method of Japanese Patent Laid-Open No. 2002-091743, it is possible for a user to know the charging amount for a page to be printed, however, the image attribute and the color pixel ratio of each page used for charging calculation are not displayed on the operation unit of the apparatus, and therefore, it is not possible to know the image attribute and the color pixel ratio of each page.

SUMMARY OF THE INVENTION

The image processing apparatus of the present invention includes a determination unit configured to determine an image attribute of image data in accordance with a color pixel ratio in the image data and a display control unit configured to control a display unit to display the determined image attribute and the color pixel ratio.

According to the present invention, it is possible for a user to easily grasp with which image attribute and at which charging unit price each page of the printed matter to be output is printed.

Further features of the present invention will become apparent from the following description of exemplary embodiments (with reference to the attached drawings).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram showing an example of a system configuration of an image forming system according to a first embodiment;

FIG. **2** is a block diagram for explaining an internal configuration of a control unit of an image forming apparatus;

FIG. **3** is a diagram showing details of processing in a scanner image processing unit;

FIG. **4** is a diagram showing details of various kinds of image processing performed on output image data in a print image processing unit;

FIG. **5** is a diagram showing an external appearance of the image forming apparatus;

FIG. **6** is a flowchart showing a flow of processing in the case where copy processing is performed in the image forming apparatus;

FIG. **7** is a diagram showing an example of a Main menu screen displayed at the time of activation of the image forming apparatus;

FIG. **8** is a diagram showing an example of a State check screen;

FIG. **9** is a diagram showing an example of a Job history detailed information screen;

FIG. **10** is a diagram showing an example of a Job history detailed information (by page) screen;

FIG. **11** is a diagram showing an example of a Color pixel determination result screen;

FIG. **12** is a diagram showing an example of a screen indicating that printing is being performed (Printing-time screen);

FIG. **13** is a diagram showing an example of a screen indicating that printing is completed (Printing completion screen);

FIG. **14** is a diagram showing an example of a Saved file screen;

FIG. **15** is a diagram showing an example of a Saved file detailed information screen;

FIG. **16** is a diagram showing an example of a Printing-time image attribute information screen;

FIG. **17** is a diagram showing an example of a message indicating that printing processing is not performed yet; and

FIG. **18** is a flowchart showing a flow of processing in the case where printing is performed by acquiring image data from a server.

DESCRIPTION OF THE EMBODIMENTS

Hereinafter, with reference to attached drawings, the present invention is explained in detail based on preferred embodiments thereof. Configurations shown in embodiments below are mere examples and the present invention is not limited to the configurations shown schematically.

<First Embodiment>

FIG. **1** is a diagram showing an example of s system configuration of an image forming system according to the present embodiment.

An image forming apparatus **100** capable of color printing includes a control unit **101**, a scanner unit **102** configured to read a document, a printer unit **3** as a printer engine, an operation unit **104** as a user interface, and a charging unit **105** configured to perform charging processing. The scanner unit **102**, the printer unit **103**, the operation unit **104**, and the charging unit **105** are each connected to the control unit **101** and the control unit **101** is connected to a network transfer unit, such as a LAN **150**, and a public circuit **160**. From the public circuit **160**, it is possible to perform transmission by a G3 or G4 facsimile machine, including color image transmission. Further, to the LAN **150**, other image forming apparatuses **110** and **120** having the same configuration as that of the image forming apparatus **100** are connected. Furthermore, a personal computer (PC) **130** is connected and it is possible to

transmit and receive a file using the FTP or SMB protocol and to transmit and receive an electronic mail. The image forming apparatuses **100**, **110**, and **120** are connected to a server **140** and are capable of transmitting and receiving various kinds of data and storing data in the server **140**.

The charging unit **105** performs charging processing in accordance with charging information, to be described later. Specifically, the charging unit **105** displays a charge for use calculated based on the charging information on the operation unit **104** to prompt a user to pay the charge for use and receives a predetermined amount of money (for example, coins or bills) through a slot, not shown schematically.

FIG. **2** is a block diagram for explaining an internal configuration of the control unit **101** of the image forming apparatus.

The control unit **101** includes each unit below.

A CPU **201** reads control programs and performs various kinds of processing, and comprehensively controls each unit. The CPU **201** also generates charging information for charging in accordance with the contents of printing. The generated charging information is sent to the charging unit **105** through a charging unit I/F **229**.

A RAM **202** is a system work memory for the CPU **201** to operate and is also an image memory for temporarily storing image data.

A ROM **203** is a boot ROM and stores boot programs of the system.

An HDD **204** is a hard disk drive and stores system software and image data.

An operation unit I/F **205** is an interface unit with the operation unit **104** and outputs image data to be displayed on the operation unit **104** to the operation unit **104**. Further, the operation unit I/F **205** plays a role to transfer information input by a user via the operation unit **104** to the CPU **201**.

A network I/F **206** connects to the LAN **150** and inputs and outputs various kinds of information.

A modem **207** connects to the public circuit **160** and inputs and outputs various kinds of information.

A binary image rotation unit **208** and a binary image compression/decompression unit **209** change the direction of an image before transmitting binary image data by the modem **207** and perform processing to convert the resolution into a predetermined resolution or into a resolution in accordance with the performance of the other party. Compression and decompression support JBIG, MMR, MR, and MH.

A DMAC **210** is a DMA controller and reads image data stored in the RAM **202** without interposition of the CPU **201** and transfers the data to an image bus I/F **211**. Alternatively, the DMAC **210** writes image data from the image bus into the RAM **202** without interposition of the CPU **201**. Each unit described above is connected to a system bus **212**.

The image bus I/F **211** is an interface for controlling fast input and output of image data via an image bus **213**.

A compression unit **215** performs processing to perform JPEG compression on image data in units of 32 pixels×32 pixels before sending out the data to the image bus **213**.

A decompression unit **216** performs processing to decompress image data sent via the image bus **213**.

A raster image processor (RIP) **217** receives a PDL code from a host computer via the network I/F **207** and the CPU **201** stores the code in the RAM **202** through the system bus **212**. The CPU **201** converts the PDL code into an intermediate code and inputs the intermediate code to the RIP **217** via the system bus **212** again and the intermediate code is developed into a bit map image (multi-valued) in the RIP **217**.

A scanner image processing unit **218** performs various kinds of image processing, such as correction, treatment, and edition, on the input image data (color image data or monochrome image data) read by the scanner unit **102** (multi-valued).

A print image processing unit **219** performs various kinds of image processing for printing processing on image data in the output stage (hereinafter, referred to as "output image data") in which printing settings etc. are reflected. At the time of printing, the decompression unit **216** carries out binary to multi-value conversion, and therefore, it is possible to produce a binary or multi-valued output. Further, the print image processing unit **219** determines whether output image data includes color pixels (hereinafter, referred to as "color pixel determination"). Details of the color pixel determination processing will be described later.

An image conversion unit **220** carries out various kinds of conversion on image data on the RAM **202** or at the time of returning image data to the RAM **202**.

A rotation unit **221** performs processing to rotate an image in units of 32 pixels×32 pixels through a specified angle to prepare for binary and multi-valued input and output.

A scaling unit **222** performs processing to convert the resolution of an image (for example, from 600 dpi to 200 dpi) or to change the magnification (for example, from 25% to 400%). Before changing the magnification, the scaling unit **222** rearranges the image of 32 pixels×32 pixels into an image in units of 32 lines.

A color space conversion unit **223** converts a multi-valued input image by a matrix operation or LUT, for example, converts a YUV image on the memory into a Lab image and stores the Lab image on the memory. The color space conversion unit **223** performs a 3×8 matrix operation and has a one-dimensional LUT, and also performs the publicly-known background removal and processing to prevent show-through. The converted image data is output as multi-valued data.

A binary to multi-value conversion unit **224** converts a 1-bit binary image into an 8-bit multi-valued image with a 256-step gradation.

A multi-value to binary conversion unit **225** converts, for example, an 8-bit image with a 256-step gradation on the memory into a 1-bit image with a 2-step gradation by a method, such as error diffusion processing.

A combination unit **226** performs processing to combine two multi-valued images on the memory into one multi-valued image. For example, by combining an image of a company's logotype and a document image on the memory, it is possible to generate an output image in which the company's logotype is attached to the document image.

A thinning unit **227** carries out resolution conversion by thinning pixels of a multi-valued image. It is possible to output a multi-valued image of a resolution ½, ¼, or ⅛ of the original one. By using the thinning unit **227** together with the scaling unit **222**, it is possible to perform enlargement and reduction in a wider range.

A moving unit **228** performs processing to add a marginal part to a binary image and a multi-valued image that are input or to remove a marginal part.

It is possible for the rotation unit **221**, the scaling unit **222**, the color space conversion unit **223**, the binary to multi-value conversion unit **224**, the multi-value to binary conversion unit **225**, the combination unit **226**, the thinning unit **227**, and the moving unit **228** to operate in an interlocking manner with one another. For example, in the case where a multi-valued image on the memory is rotated and the resolution of which is converted, it is possible to perform both pieces of processing in an interlocking manner without interposition of the memory.

The above is the internal configuration of the control unit **101**.

FIG. **3** is a diagram showing details of the processing in the scanner image processing unit **218**.

Each 8-bit brightness signal of RGB input from the scanner unit **102** is first converted into a standard color signal of RGB that does not depend on the filter color of CCD by masking **301**.

In a filter **302**, for example, processing to blur an image or to make an image vivid is performed using a 9×9 matrix.

In a histogram **303**, sampling of image signal data in an input image is performed. In this module, a histogram is created by performing sampling in a main scan direction and in a sub scan direction at a constant pitch on RGB data within a rectangular area surrounded by start points and end points specified in the main scan direction and in the sub scan direction, respectively. The created histogram is read at the time of specification of background removal or show-through prevention and from the histogram, the background of a document is estimated and the estimated background is stored and managed as a background removal level together with the image data in the memory or the HDD and is used in image processing at the time of printing or transmission.

In gamma correction **304**, processing to increase or reduce the density of the whole of an image. For example, the color space of an input image is converted into an arbitrary color space, and processing to correct hue of the input data is performed. For example, in order to determine whether a read document is a color document or a monochrome document, the image signal before scaling is converted into the publicly-known Lab color space by color space conversion **305**.

A comparator **306** performs processing to determine whether a color represented by an image signal is a chromatic color or an achromatic color by comparing color signal components of a and b of the image signal converted into the Lab color space with a threshold value and outputs a 1-bit determination signal.

A counter **307** measures a determination signal from the comparator **306**.

In character/photo determination **308**, processing to separate an input image into characters and photos by extracting character edges from the input image and outputs a character/photo determination signal. The character/photo determination signal is also stored together with the image data in the memory or HDD and is used at the time of printing.

A specific document determiner **309** compares an input image signal with a predetermined pattern prepared in advance to determine to which extent the image signal and the pattern agree and outputs a determination result indicating agreement or disagreement. In accordance with the determination result, treatment processing etc. is performed on the input image, thereby preventing forgery of bills or securities.

FIG. **4** is a diagram showing details of the various kinds of image processing performed on output image data in the print image processing unit **219**. In the present embodiment, a case is explained as an example, where the output image data in the stage of being decompressed in the decompression unit **216** is RGB data.

In background removal **401**, the ground color of the output image data (RGB data) is removed and unnecessary fog of the background is removed. For example, the background removal is performed by a 3×8 matrix operation or a one-dimensional LUT.

In monochrome creation **402**, processing to convert color image data represented by RGB into Gray monochrome data is performed at the time of printing the data as a monochrome by converting the color image data into monochrome data. For example, a 1×3 matrix operation to multiply RGB by arbitrary constants to obtain a Gay signal is included.

In output color correction **403**, color correction is made for color image data in accordance with the characteristics of the printer unit **103**. For example, a 4×8 matrix operation and processing by direct mapping are included. In the output color correction **403**, processing to convert RGB data into CMYK data is also performed.

In filter processing **404**, processing to arbitrarily correct a spatial frequency of output image data is performed. For example, processing to perform a 9×9 matrix operation is included.

In gamma correction **405**, processing to make gamma correction is performed on output image data in accordance with the characteristics of the printer unit **103**. Normally, a one-dimensional LUT is included.

In halftone correction **406**, arbitrary halftone processing is performed on output image data in accordance with the number of gradations of the printer unit **103**, specifically, arbitrary screen processing, such as binarization and value multiplexing into a 32-valued image, and error diffusion processing are performed. It is also possible to switch pieces of processing by a character/photo determination signal, not shown schematically.

A drum-to-drum delay memory **407** is a memory used for accurately overlapping CMYK images by shifting the printing timings of CMYK by a period of time corresponding to the interval between each photoreceptor drum in a color printer including the photoreceptor drum of each color of CMYK. Due to this, output image data is subjected to delay processing in accordance with the drum arrangement and sequentially sent to the printer unit **103**.

FIG. **5** is a diagram showing an external appearance of an image forming apparatus.

The scanner unit **102**, which is an image input device, converts an image on a document into an electric signal as raster image data by illuminating the image and causing a CCD line sensor (not shown schematically) to scan. A document is set on a tray **502** of a document feeder **501** and the control unit **101** gives instructions to read the document to the scanner unit **102** in response to user's instructions via the operation unit **104** and the scanner unit **102** performs a read operation by feeding document sheets one by one from the tray **502**.

The printer unit **103**, which is an image output device, is a unit configured to form an image represented by raster image data on a sheet. In the present embodiment, explanation is given with an electrophotographic system as an example of such a system, however, the system is not limited to this and, for example, another system may be used, such as an inkjet system. The electrophotographic system is a system in which a latent image is formed on a photoreceptor drum by utilizing laser beams, the latent image is developed by a plurality of charged color materials (for example, toner of four colors of CMYK), and the developed image by toner is transferred to a transfer sheet and fixed, and thus the image is recorded. The inkjet system is a system in which a heating element or a piezoelectric element is used as a discharge energy generating element, a plurality of color materials (for example, ink of four colors of CMYK) is discharged from nozzles, and the ink is caused to stick to a recording medium, and thus, recording is performed. The printing operation starts by printing instructions from the control unit **101**. The printer unit **103** has a plurality of paper feeding stages so that different sheet sizes or different sheet orientations can be selected and also has sheet cassettes **503**, **504**, and **505** corresponding thereto and a discharge tray **506** configured to receive printed sheets.

Next, color pixel determination processing in the present embodiment is explained.

In order to perform color pixel determination processing at a single part and to limit a color space to be input to one regardless of the kinds of jobs, it is necessary to perform color pixel determination processing with a timing at the time of the output color correction **403** in which RGB data is handled or earlier, or at the time of the filter processing **404** in which CMYK data is handled or later. It is desirable to perform color pixel determination processing on CMYK data corresponding to each color of CMYK of the photoreceptor drum rather than performing on RGB data because a color pixel determination result with high precision is obtained. That is, it is desirable to perform color pixel determination processing on image data configured by color components corresponding to a plurality of color materials used for forming an image. Even in the case where color pixel determination processing is performed on CMYK data, it is thought that a color pixel determination result with higher precision is obtained with timing nearer to the stage immediately before the data is sent to the printer unit **103**. In the present embodiment, it is assumed that color pixel determination is performed immediately before the halftone correction **406** (i.e., on CMYK data having been subjected to gamma correction processing).

A procedure of color pixel determination in the present embodiment is as follows.

First, a data sequence of raster image data, which is output image data, is scanned and the number of pixels in which any one of colors of CMY has a gradation value equal to or more than a predetermined value (for example, equal to or more than 1) is counted. Then, a ratio of counted pixels to all pixels (color pixel ratio) of the raster image is calculated. Then, the calculated color pixel ratio is compared with a threshold value held in advance and the image attribute of the raster image is determined. Such processing is performed in unit of pages of the output image data. In the present embodiment, the image attribute is classified into three kinds, i.e., "Low area color", "Middle area color", and "Full area color" and to which image attribute an image belongs is determined using two threshold values. A first threshold value corresponds to a demarcation position between Low area color and Middle area color and a second threshold value corresponds to a demarcation position between Middle area color and Full area color, and it is possible to arbitrarily change the demarcation positions by changing the threshold values. For example, Low area color is the image attribute of a page whose color pixel ratio is 1% to 10%, Middle area color is the image attribute of a page whose color pixel ratio is 10% to 80%, and Full area color is the image attribute of a page whose color pixel ratio is 80% to 100%. The number of kinds of image attributes is not limited to three and it is needless to say that the number of threshold values corresponding to demarcation positions changes in accordance with the number of kinds of image attributes into which the image attribute is classified.

The image attribute thus determined is used for generating charging information as a charging unit price. For example, it is assumed that charging unit prices are set as "Low area color": 10 yen/page, "Middle area color": 20 yen/page, and "Full area color": 30 yen/page. In this case, an amount of money calculated by multiplying the charging unit price corresponding to the determined image attribute by the number of output pages is determined as a charging amount and the charging amount is sent to the charging unit **105** as charging information.

As described above, in the present embodiment, it is assumed that color pixel determination processing is performed in the print image processing unit **219**, however, this is not limited. It may also be possible to provide an independent processing unit configured to perform color pixel determination processing using output image data separately from the print image processing unit.

FIG. **6** is a flowchart showing a flow of processing in the case where copy processing (processing to form an image on a recording medium, such as paper, in the printer unit **103** using image data read by the scanner unit **102**) is performed in the image forming apparatus **100**. The series of processing is performed by the CPU **201** executing a computer-executable program in which a procedure shown below is described after reading the program from the HDD **204** etc. onto the RAM **202**.

In the case where a user performs predetermined printing settings (for example, 2in1, 4in1, one-side, both-side, etc.) and then gives instructions to execute copying via the operation unit **104**, the CPU **201** instructs the scanner unit **102** to read a document at step **601**. The image data read by the scanner unit **102** is stored in the HDD **204**.

At step **602**, the print image processing unit **219** reads output image data corresponding to one page from the HDD **204** and starts the image processing for printing described above.

At step **603**, the print image processing unit **219** performs the above-described color pixel determination processing immediately before the halftone correction **406** on the read output image data corresponding to one page and determines an image attribute of the output image data corresponding to one page. Information of the determined image attribute is sent to the CPU **201**.

At step **604**, the CPU **201** sends the output image data corresponding to one page to the printer unit **103** (printer engine). The printer unit **103** performs printing processing using the received output image data.

At step **605**, the CPU **201** determines whether printing of the one page is completed. In the case where printing of the one page is completed, the procedure proceeds to step **607**.

At step **606**, the CPU **201** sends information relating to the printing of the one page for which printing processing is completed, specifically, information of the color pixel ratio (color pixel ratio information) and information of the above-described image attribute (image attribute information) to the operation unit **104** via the operation unit I/F **205**. Then, on a UI screen of the operation unit **104**, the received information relating to the printing of the one page is displayed. Details of the display will be described later.

At step **607**, the CPU **201** determines whether printing of all the pages of the output image data is completed. In the case where printing of all the pages is completed, the procedure proceeds to step **608**. In the case where there is a page(s) not printed yet, the procedure returns to step **602**.

At step **608**, the CPU **201** calculates a charging amount for the output image data of all the pages based on the image attribute information for each page. For example, in the case where output image data includes five pages and the determined image attribute of all the pages is "Middle area color (charging unit price: 20 yen/page)", 5×20=100 (yen) is calculated. Information of the calculated charging amount is sent to the charging unit **105** via a charging unit I/F **229**.

At step **609**, the CPU **201** obtains the number of output sheets for each image attribute based on the image attribute information of all the pages. Then, the CPU **201** sends information of the obtained number of output sheets for each image attribute (by-image-attribute output sheet number information) and information of the total number of output pages and the charging amount for all the pages to the opera-

tion unit **104** via the operation unit I/F **205**. Then, on the UI screen of the operation unit **104**, these pieces of information are displayed.

At step **610**, the CPU **201** transmits the color pixel ratio information, the image attribute information, and the by-image-attribute output sheet number information described above to the server **140**, which is an external device, via the network I/F **206**. The server **140** stores these pieces of information received. The server **140** holds the above-mentioned three pieces of information in a job history information management table for managing a history at the time of job execution. It is possible for a user to check the history of a job on the UI screen of the operation unit **104** by accessing the server **140**, which is an external device, to acquire the job history information management table. The place where the job history information management table such as this is stored may be within the image forming apparatus (for example, the HDD **204**).

Here, with reference to FIG. **7** to FIG. **11**, the UI screen displayed in the operation unit **104** in the case where a user checks etc. job history information is explained.

FIG. **7** is a diagram showing an example of a Main menu screen displayed at the time of activation of the image forming apparatus. On a Main menu screen **700**, buttons for each function, i.e. "Copy", "Scan and transmit", "Scan and save", and "Use saved file" are provided. As a button to check information during the job execution and information after the job is completed, there is provided a State check button **701**. A user presses the State check button **701** to check job history information. In response to pressing of the State check button **701**, the screen changes to a State check screen. FIG. **8** is a diagram showing an example of the State check screen. On a State check screen **800**, buttons for each function, i.e. "Copy/print", "Transmit", "Save", and "Check consumables" are provided. In the case where a user intends to check job history information after copying is completed, the user selects a Job history button **802** in the state where a "Copy/print" button **801** is selected and selects "Copy" in a pull-down display area **803** where either of "Copy" and "Print" can be selected. Then, items, such as "Time" at the time of execution of copying, "User name", "Number of sheets·number of copies", and "Result" indicating whether or not printing is completed normally are displayed in a list for each job. As the features of the present embodiment, mention is made of that a "By-image-attribute sheet number" **804** is provided in the items displayed in a list. In the item of "By-image-attribute sheet number", the number of sheets of Low area color, the number of sheets of Middle area color, and the number of sheets of Full area color are displayed in a simple manner. In the case where the number of jobs displayed in a list of the job history is not accommodated in one screen, the page is divided and the total number of pages and the page number currently being checked are displayed and it is made possible to move between pages (**805**). By pressing an OK button **806**, the State check screen **800** is closed and the screen returns to the Main menu screen **700**. By pressing a Detailed information button **807**, the screen changes to a screen to check detailed information of the job currently being selected (Job history detailed information screen). FIG. **9** is a diagram showing an example of the Job history detailed information screen. In the present embodiment, color pixel determination by a printer device is performed, and therefore, in an item of "Number of output pages" **901**, "By-image-attribute sheet number" is displayed. Further, in the present embodiment, a Detailed information (by page) button **902** to check more detailed information for each page is provided within the item of "Number of output pages". By pressing the Detailed information (by page) button **902**, the screen changes to a "Job history detailed information (by page) screen". FIG. **10** is a diagram showing an example of the Job history detailed information (by page) screen. On a Job history detailed information (by page) screen **1000**, the image attribute and the color pixel ratio for each page of output printed matter are displayed in a list. By selecting an arbitrary item from the displayed list and pressing a Determination result image button **1001**, the screen changes to a screen to check the result of the color pixel determination processing of the page (Color pixel determination result screen). FIG. **11** is a diagram showing an example of the Color pixel determination result screen. On a Color pixel determination result screen **1100**, together with the information of the image attribute and the color pixel ratio, which is the result of the color pixel determination processing of the page, an image **1101** indicating an area determined to include color pixels in the page is displayed. In this manner, an area determined to include color pixels is displayed separately from an area determined to include no color pixels.

FIG. **12** is a diagram showing an example of a screen indicating that printing is being performed (Printing-time screen) displayed in the operation unit **104** at step **607**. On a Printing-time screen **1200**, information of, such as the kind of Document, Magnification, Sheet size, Number of pages of Document, Number of sheets output, Number of copies, and Print density, which are conventional contents of the display, is displayed. Further, on the Printing-time screen **1200**, information **1201** of Image attribute, Color pixel ratio, and Charging unit price of a page already printed, and information **1202** of the number of a page currently being printed are also displayed. An Abort button **1203** is a button to abort a job currently being executed.

FIG. **13** is a diagram showing an example of a screen indicating that printing is completed (Printing completion screen) displayed in the operation unit **104** at step **609**. On a Printing completion screen **1300**, information of Number of output pages, By-image-attribute sheet number, and Total amount of money is displayed. By pressing a Detailed information button **1301** within the Printing completion screen **1200**, the screen changes to the Job history detailed information screen **900** (FIG. **9**) described previously and it is possible for a user to check details of the output printed matter.

In the present embodiment, the case is explained as an example, where printing processing is performed in accordance with a copy job, however, it is needless to say that the present embodiment can be applied to the case of printing processing in accordance with a PDL print job. In such a case, processing necessary to execute a PDL print job, such as rendering of PDL data, is performed in place of the scan of a document (step **601**).

Further, at step **610**, it may also be possible to save, for example, images indicative of the result of color pixel determination processing (images whose color areas are visualized in units of pages: see FIG. **11**, to be described later) for all the pages in place of the above-mentioned three pieces of information. In such a case, for example, on the Job history detailed information screen, necessary alteration is made, such as that thumbnail images of images indicative of the result of color pixel determination processing for all the pages are displayed etc.

According to the present embodiment, information of the image attribute and the color pixel ratio of each output page is displayed at the time of printing and it is possible to know with which image attribute and at which charging unit price each page of the output printed matter is printed. Further, by storing the information of the image attribute and the color

pixel ratio of each output page as a history, it is possible for a user to check these pieces of information later.

<Second Embodiment>

In the first embodiment, the case is explained where printing processing is performed using image data obtained by the scanner unit or PDL data input via a LAN as it is. In a second embodiment, a case is explained where image data obtained by the scanner unit is saved in a server and printing processing is performed by acquiring the image data from the server.

(Saving of Image Data Obtained by Scan)

A user selects "Scan and save" on the Main menu screen **700** described previously and after performing various kinds of settings of, such as a saving destination (here, the server **140**), a saved file format, and a resolution at the time of a scan on a setting screen, not shown schematically, the user gives instructions to perform a scan. Upon receipt of the instructions to perform a scan, the image forming apparatus acquires image data by reading a document by the scanner unit **102** and sends the acquired image data to the server **140**, which is an external device. Then, the server **140** saves the received image data within a predetermined storage area and also saves detailed information of the received image data in a "Saved data management table". Information saved here in the "Saved data management table" includes information of Printing-time image attribute besides File format, File name, Date of saving, etc., of the saved image data. Printing-time image attribute includes information of, such as Time of printing, Settings of printing (2in1, 4in1, one-side, both-side, etc.), and By-image-attribute sheet number at the time of performing printing processing on the saved image data, and the contents are updated each time printing processing is performed. Printing-time image attribute of image data for which printing processing is not performed yet but is just saved within the server **140** is saved as "Printing not performed yet".

(Printing of Saved Image Data)

At the time of printing image data saved in the server **140**, which is an external device, or at the time of checking detailed information of image data within the server **140**, a user presses the "Use saved file" button on the Main menu screen **700** described previously. Due to this, the screen changes to a Saved file screen.

FIG. **14** is a diagram showing an example of the Saved file screen. On a Saved file screen **1400**, saved image data (saved file) is displayed in a list. Selecting arbitrary image data from the displayed list and pressing a Print button **1401** cause printing processing to be performed. Pressing a Detailed information button **1402** causes the screen to change to a screen on which to check detailed information of the image data being selected (Saved file detailed information screen).

FIG. **15** is a diagram showing an example of the Saved file detailed information screen. An item of "Color/Monochrome" on a Saved file detailed information screen **1500** indicates the result of color/monochrome determination performed by the scanner unit **102** at the time of scan processing of the saved image data. It is also possible for a user to specify color or monochrome in which to save image data and in this case, the contents will be those specified by the user. At the time of printing image data saved within the server **140**, the image data for which "Monochrome" is selected in the item of "Color/Monochrome" is printed and output with the image attribute of Low area color. The image data for which "Color" is specified in the item of "Color/Monochrome" is printed in accordance with the image attribute determined by the color pixel determination described previously.

By pressing a Printing-time image attribute information button **1501** within the Saved file detailed information screen **1500**, a screen on which to check information of the image attribute etc. at the time of printing of the saved file (Printing-time image attribute information screen) is displayed. FIG. **16** is a diagram showing an example of the Printing-time image attribute information screen. On a Printing-time image attribute information screen **1600**, information of, such as Time of printing, Settings of printing (2in1, 4in1, one-side, both-side, etc.), and By-image-attribute sheet number, at the time of printing of the saved image data is displayed in a list. Further, information of, such as the color pixel ratio for each page, the image attribute, and the charging amount for all the pages, may be included. In the case of the image data for which printing processing is not performed yet even once, in place of the Printing-time image attribute information screen **1600**, a message indicating that printing processing is not performed yet is displayed. FIG. **17** is an example of the message indicating that printing processing is not performed yet and in this example, a message that "Printing not performed yet (at present, there is no information at the time of performing printing)" is displayed. By pressing a Detailed information button **1601** within the Printing-time image attribute information screen **1600**, the Job history detailed information screen **900** (FIG. **9**) described previously is displayed and it is possible for a user to check the detailed information of history of the job being selected.

Subsequently, a flow of processing in the image forming apparatus in the case where saved image data is acquired from the server and printed is explained with reference to a flowchart in FIG. **18**. The flowchart in FIG. **18** is almost the same as the flowchart in FIG. **6** in the first embodiment, and therefore, different points are explained mainly below.

In response to instructions to print specific image data (saved file) within the server **140** by a user via the operation unit **104**, the CPU **201** accesses the server **140** to acquire image data specified by the user and stores the data in the HDD **204** at step **1801**. Then, printing processing using the image data stored in the HDD **204** is performed and after printing processing of the last page is completed, information etc. of, such as the color pixel ratio in relation to the print job, is saved in the Job history information management table (step **601** to step **610**). Step **601** to step **610** are already explained in the first embodiment, and therefore, explanation thereof is omitted here.

At step **1802**, the CPU **201** accesses the server **140** via the network I/F **206** and gives instructions to update "Printing-time image attribute information" of the image data within the "Saved data management table". After "Printing-time image attribute information" is updated in the server **140**, the update is reflected in the display of the Printing-time image attribute information screen **1600** described previously.

According to the present embodiment, it is possible for a user to predict which printing settings will result in printing to be performed with which image attribute and at which charging unit price at the time of performing printing using image data saved in the server etc.

(Other Embodiments)

Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-described embodiment (s), and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiment (s). For this purpose, the program is provided to the computer for example via a network or from

a recording medium of various types serving as the memory device (e.g., computer-readable medium).

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2013-033333, filed Feb. 22, 2013, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An image processing apparatus comprising:

a determination unit configured to determine an image attribute of image data in accordance with a color pixel ratio in the image data; and

a display control unit configured to control a display unit to display the determined image attribute and the color pixel ratio.

2. The image processing apparatus according to claim **1**, wherein

the determination unit performs color pixel determination processing to determine whether each pixel included in the image data is a color pixel and to determine the image attribute by calculating the color pixel ratio based on the determination processing result.

3. The image processing apparatus according to claim **1**, wherein

the determination unit determines the image attribute in units of pages of the image data, and

the display control unit controls the display unit to display the determined image attribute in units of pages.

4. The image processing apparatus according to claim **3**, further comprising a unit configured to calculate a number of output sheets for each image attribute based on the determined image attributes for all the pages, wherein

the display control unit controls the display unit to display the calculated number of output sheets for each image attribute.

5. The image processing apparatus according to claim **1**, further comprising a unit configured to calculate a charging amount based on the determined image attribute.

6. The image processing apparatus according to claim **1**, wherein

the image data is image data including color components corresponding to a plurality of color materials used for forming an image.

7. The image processing apparatus according to claim **1**, further comprising a storing unit configured to store information displayed by the display control unit.

8. The image processing apparatus according to claim **2**, wherein

the display control unit controls the display unit to display an area determined to include color pixels by the color pixel determination processing separately from an area determined to include no color pixels.

9. An image processing method comprising the steps of:

determining an image attribute of image data in accordance with a color pixel ratio in the image data; and

controlling a display unit to display the determined image attribute and the color pixel ratio.

10. A non-transitory computer readable storage medium storing a program for causing a computer to perform the image processing method according to claim **9**.

11. An image processing apparatus comprising:

a determination unit configured to determine a ratio of color pixels in image data; and

a control unit configured to control displaying of the determined ratio of color pixels on a display unit.

12. The image processing apparatus according to claim **11**, wherein

the ratio refers to the ratio of the number of color pixels in the image data to the total number of pixels in the image data.

13. The image processing apparatus according to claim **11**, wherein

the color pixel ratio refers to the ratio of the number of color pixels in the image data to the total number of pixels in the image data.

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